Measurements of thermal photons in heavy ion collisions with PHENIX

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Thermal photons are thought to be the ideal probe to measure the temperature of the quark-gluon plasma created in heavy ion collisions. The momentum range of 1–3 GeV may provide a window to detect such thermal radiation against contributions from hadron decays and other direct photon sources. Because the fraction of thermal photons is small, their measurement has been a challenge in heavy ion physics since many years.
To address this challenge, the PHENIX experiment has developed a number of diverse techniques. These techniques include methods of analyzing real photons measured in the PHENIX electromagnetic calorimeter, studies of real photons through external photon conversions, as well as the measurement of virtual photons detected as internal conversion electron-positron pairs. Comparing results from different approaches reduced the overall systematic uncertainties so that the significance of a thermal photon contribution in Au+Au collisions, which is absent in p+p collisions, can be evaluated.
In this talk we present the latest results from PHENIX data taken at $\sqrt{s_{NN}} = 200$ GeV. In particular, results from Au-Au collisions at low p_T obtained by various techniques will be compared. These results will be contrasted with the baseline from p+p data to establish a best estimate for thermal photon production in Au+Au. They can also be used to derive a limit on the initial temperature of the QGP created in heavy ion collisions at RHIC.